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SUBSTITUTE SPECIFICATION
PATENT

INSTITUT FRANÇAIS DU PETROLE

**METHOD FOR DETERMINING THE RESISTIVITY INDEX, AS A FUNCTION OF
THE WATER SATURATION, OF CERTAIN ROCKS
OF COMPLEX POROSITY**

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ABSTRACT

A method for determining the variations of the resistivity index (RI) of a family of rock samples of complex pore structure with at least two pore networks, as a function of the water saturation (S_w), and in the presence of a non-oil conducting fluid. The volume fraction (f_1, f_2, f_3) occupied by each pore network and the distribution of the pore throats in the various pore networks are determined for each sample of the family. The values of coefficients relating the variation of its electrical resistivity as a function of its water saturation (S_w) are experimentally determined on a sample of the family used as a reference sample. The resistivity index (RI) of all the samples of the family is then determined on the basis of the variation of parameters describing the layout of the pore network, and using the values of the coefficients measured on the reference sample. The method allows measurement of a continuous resistivity index curve which is not obtained, as in conventional techniques, from only a limited number of points at capillary equilibrium.

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BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a method for determining the resistivity index RI, as a function of the water saturation, of certain rocks of complex porosity.

Description of the Prior Art

[0002] Evaluation of carbonate reservoirs is a particularly difficult task for petrophysicists, who still lack precise knowledge concerning the carrying properties within these porous media. In relation to siliclastic rocks, carbonates may be simpler on the mineralogical plane, but they are incomparably more complex in terms of pore structure and surface properties. The largely biological origin of the sediments, combined with various diagenetic processes, leads to complex pore structures that may be very different from one reservoir to the next. For many carbonate systems, resistivity data calibrations carried out in the laboratory contradict the observations made in the field (anhydrous production, capillary pressure) and the direct water saturation measurements performed on preserved cores.